

New Records of the Leptoceridae (Trichoptera) from Korea

Sun-Jin PARK, Yeon-Jae BAE, and Lianfang YANG¹⁾

Department of Biology, Seoul Women's University, Seoul 139-774, Korea

¹⁾Department of Plant Protection, Nanjing Agricultural University, Nanjing 210095, China

Abstract Seven species of Leptoceridae are newly recorded from Korea: *Mystacides azurea* (Linnaeus) is newly recorded from the Korean peninsula and *Ceraclea armata* Kumanski, *C. lobulata* (Martynov), *C. morsei* Kumanski, *C. sibirica* (Ulmer), *Mystacides dentata* Martynov, and *Triaenodes unanims* McLachlan, are newly recorded from South Korea. For each species, diagnosis for known male and female adults with line-drawings of key characters, taxonomic remarks, synonymy, and Korean names were also provided.

Key words Trichoptera, Leptoceridae, taxonomy, Korea

INTRODUCTION

Over 900 species in 45 known genera were described in the caddisfly family Leptoceridae throughout the world (Morse, 1981). Larvae live in a wide range of lotic and lentic habitats. Their larval cases are usually cylindrical, tapered, slightly curved, and made of a variety of plant and mineral materials. Adults of Leptoceridae can be easily distinguished from those of other families by long antennae, usually 2-3 times longer than the forewings, and maxillary palpi.

The early faunistic studies on the adults of Korean leptocerids were made by Tsuda (1942), Botosaneanu (1970), Mey (1989), and Kobayashi (1989). Kumanski (1991) recently conducted a comprehensive taxonomic study on the adults of Korean Leptoceridae, with a report of 26 species including six new species. As results of the above investigations, 33 species (including five undetermined species) and nine genera of the family were known in Korea (Park and Bae, 1998). All of the known species, except *Ceraclea shuotsuensis* (Tsuda) which Kobayashi (1989) reported, were recorded only from North Korea. Kim (1974) and Yoon and Kim (1988) treated 12 undetermined species of larval leptocerids from South Korea, but they have not been determined to species.

MATERIALS AND METHODS

Adult materials for this study were based on the collection which were collected from South Korea since

1985 and deposited at Seoul Women's University. They were mainly collected by light and in part by a sweeping net, and preserved in 80% ethanol. Diagnoses of the newly known species with line-drawings of key characters were provided. The abbreviations used in systematic account are as in Park and Bae (1998).

SYSTEMATIC ACCOUNT

Family Leptoceridae Leach 나비날도래과

Genus *Ceraclea* Stephens 나비날도래속

Ceraclea armata Kumanski 창나비날도래 (新稱)

(Figs 1, 2)

Ceraclea armata Kumanski, 1991: 63 (M, F; PB).

Diagnosis. The abdominal segment IX of male adults have longitudinal clefts apicoventrally in each side (Fig. 2); the clefts are very small and invisible dorsally (Fig. 1). The basoventral lobes of inferior appendages are thick, short, and blunt, and have large and chitinized spines; Kumanski (1991) described 2-3 spines, but the examined specimen has 3 spines (Figs 1, 2).

Material examined. 1M: GW- Donggang, Nomi Village, 22.V.1999 (J.D. Yeoh, K.S. Bae, J.I. Kim).

Distribution. Korea (North, New record: South).

Ceraclea lobulata (Martynov) 앞사귀날도래 (新稱)

(Figs 3, 4, 5, 6, 7)

Leptocerus lobulatus Martynov, 1935 (for full citation see Fischer, 1973).

Ceraclea lobulata: Morse, 1975: 40; Mey, 1989: 304 (M, F; PY); Kumanski, 1991: 62 (M, F; PB, PN, PY).

Diagnosis. Male adults of *C. lobulata* are similar to those of *C. indistincta* (Yang and Morse, 1988), but can be distinguished by the characters of genitalia (Figs 3, 4, 6, 7): superior appendages slightly pointed in dorsal view (Fig. 3); mesal ridge of each inferior appendage hooked upward (Fig. 7); paramere spines about 0.5x length of the phallobase, slightly curved as in *C. indistincta* (Fig. 6).

Material examined. 4M: GG- Cheongpyeong, 5.IX.1985; 132M: GN- Sancheong-gun, Sancheong-eub, Gyeonghogyo, 14.V.1998 (Y.J. Bae, J.M. Hwang, J.H. Hur, Y.H. Jin).

Remarks. According to J. Morse (pers. comm.), the apex of tergum IX in *Ceraclea* species is highly variable in length and in the degree of division. We found a variant of *C. lobulata* as illustrated in Fig. 5.

Distribution. Korea (North, New record: South), China, and Far East Russia.

Ceraclea morsei Kumanski 모르스날도래 (新稱)

(Figs 8, 9, 10)

Ceraclea morsei Kumanski, 1991: 58 (M, F; PB, PY).

Diagnosis. Male adults of *C. morsei* can be distinguished from *C. alboguttata* (Yang and Morse, 1988) by the characters of genitalia (Figs 8, 9, 10): basoventral lobes of inferior appendages with normal setae very short (Figs 9, 10); spine on mesal ridge stronger than that of *C. alboguttata* (Kumanski, 1991) (Fig. 10).

Material examined. 1M: GG- Cheongpyeong, Jojongchoen at bridge on Hwy 46, 15.VII.1993; 2M: GG- Yeongdong, Gyeongbu Hwy at Geumgang rest area, 14.VI.1995.

Distribution. Korea (North, New record: South).

Ceraclea sibirica (Ulmer) 시베리아나비날도래 (新稱)

(Figs 11, 12, 13, 14, 15, 16, 17)

Leptocerus sibiricus Ulmer, 1906 (for full citation see Fischer, 1973); Tsuda, 1942: 233 (M, F; HB).

Ceraclea sibirica (Ulmer): Morse, 1975; Kumanski, 1991: 62 (M, F; PB).

Diagnosis. Male adults of *C. sibirica* can be separated from *C. hastata* (Kononenko, 1997; Yang and Morse, 1988) by the characters of the genitalia (Figs 11, 12, 13, 14): superior appendage truncated (Fig. 11); hemimembranous basoventral lobes strongly curved apically (Figs 12, 13). Female adults of *C. sibirica* can be separated from other species by reaching lateral margin of the abdominal segment IX to lamella (Figs 15, 16); apexes of gonopod plate rectangular (Fig. 17).

Material examined. 224M, 183F: GN- Sancheong-gun, Sancheong-eub, Gyeonghogyo, 14.V.1998 (Y.J. Bae, J.M. Hwang, J.H. Hur, Y.H. Jin).

Distribution. Korea (North, New record: South) and Far East Russia.

Genus *Mystacides* Latreille 청나비날도래속*Mystacides azurea* (Linnaeus) 청나비날도래 (新稱)

(Figs 18, 19, 20)

Phryganea azurea Linnaeus, 1761 (for full citation see Fischer, 1973).

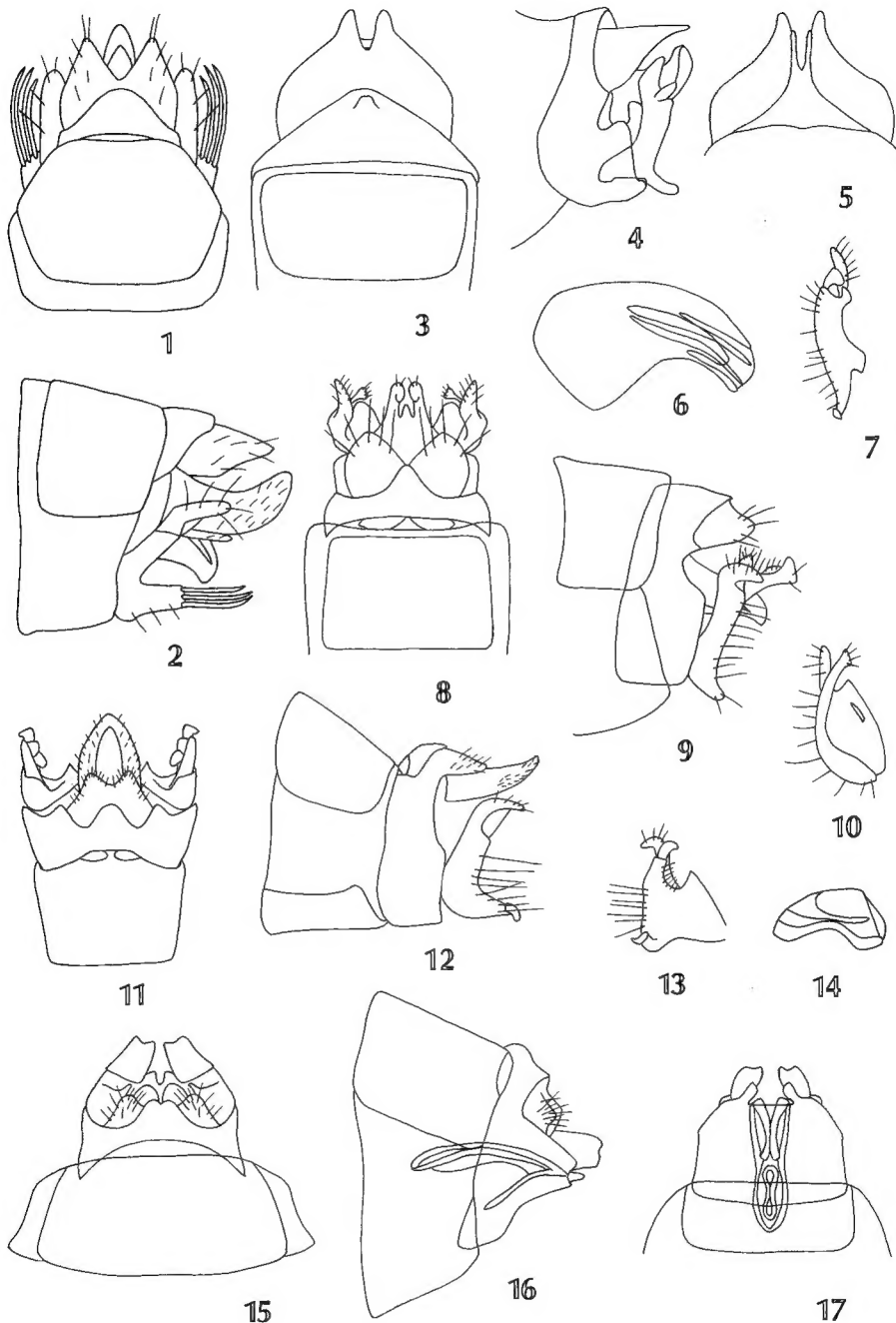
Leptocerus azureus: Billberg, 1820 (for full citation see Fischer, 1973).

Mystacides nigra Pictet, 1834 (for full citation see Fischer, 1973); Hagen, 1855 (for full citation see Fischer, 1973).

Mystax azureus: Hagen, 1849 (for full citation see Fischer, 1973).

Setodes azurea: Kolenati, 1858 (for full citation see Fischer, 1973).

Mystacida azurea: Thomson, 1862 (for full citation see Fischer, 1973).



Figs 1-17. Adult genitalia. 1, *Ceraclea armata*, male, dorsal view; 2, *C. armata*, male, lateral view; 3, *C. lobulata*, male, dorsal view; 4, *C. lobulata*, male, lateral view; 5, *C. lobulata*, variant 1, male, dorsal view; 6, *C. lobulata*, male, phallus, lateral view; 7, *C. lobulata*, male, left inferior appendage, caudal view; 8, *C. morsei*, male, dorsal view; 9, *C. morsei*, male, lateral view; 10, *C. morsei*, male, left inferior appendage, caudal view; 11, *C. sibirica*, male, dorsal view; 12, *C. sibirica*, male, lateral view; 13, *C. sibirica*, male, left inferior appendage, caudal view; 14, *C. sibirica*, male, phallus, lateral view; 15, *C. sibirica*, female, dorsal view; 16, *C. sibirica*, female, lateral view; 17, *C. sibirica*, female, ventral view.

Mystacides azurea: Hagen, 1864 (for full citation see Fischer, 1973).

Diagnosis. Female adults of *M. azurea* can be separated from other *Mystacides* species by gonopod plate and lamella (Kononenko, 1997): gonopod plate untriangular (Figs 18, 20) and lamellae without subapicolateral projection (Fig. 19).

Material examined. 21F: GN- Sancheong-gun, Sancheong-eub, Gyeonghogyo, 14.V.1998 (Y.J. Bae, J.M. Hwang, J.H. Hur, Y.H. Jin).

Distribution. East Palearctic (Far East Russia, China, and New record: Korea) and West Palearctic.

Mystacides dentata Martynov 청동나비날도래 (新稱)

(Figs 21, 22, 23, 24, 25, 26, 27)

Mystacides dentata Martynov, 1924 (for full citation see Fischer, 1973); Mey, 1989: 304 (M, F; HH); Kumanski, 1991: 70 (M, F; GW, PB, PY).

Diagnosis. Male tergum X of *M. dentata* has two asymmetrical rods (Fig. 21). Male adults of this species can be distinguished from *M. azurea* by the genitalia (Figs 21, 22, 24, 25): inferior appendages with 3 pointed projection additionally (Fig. 25) and middle one longer (Fig. 25).

Material examined. 1M: GW- Taebaegsan, 23.VII.1986; 16M: GN- Sancheong-gun, Sancheong-eub, Gyeonghogyo, 14.V.1998 (Y.J. Bae, J.M. Hwang, J.H. Hur, Y.H. Jin).

Remarks. According to J. Morse (pers. comm), among the species of *Mystacides* whose male genitalia are asymmetrical, both dextral and sinistral variations exist. A considerable variant of *M. dentata* (Fig. 23) was also found in this study. It would be interesting to discover if there is a genetic basis for these reversals or if some environmental cue is responsible for them (Morse, pers. comm.). We found another variant of *M. dentata*. This variant can be distinguished by very small projections of inferior appendages (Figs 26, 27).

Distribution. East Palearctic (New record: South Korea).

Genus *Triaenodes* McLachlan 연나비날도래속 (新稱)

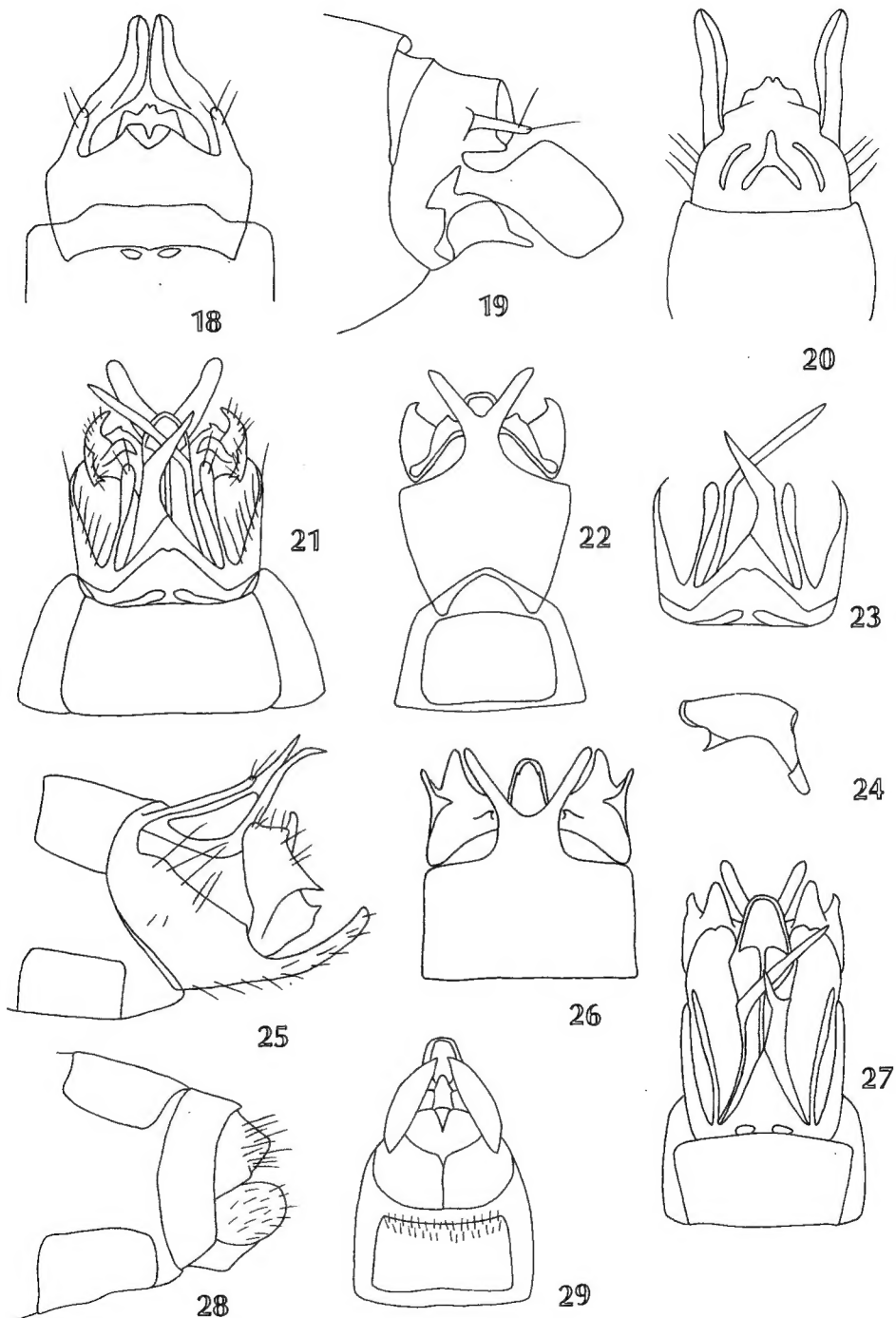
Triaenodes unanimitis McLachlan 연나비날도래 (新稱)

(Figs 28, 29)

Triaenodes unanimitis McLachlan, 1877 (for full citation see Fischer, 1973); Kumanski, 1991: 70 (M, F; GW, PN, PY).

Diagnosis. Female adults of *T. unanimitis* are different from those of *T. plectus* (Kononenko, 1997) by the genitalia: abdominal segment IX shorter than that of *T. plectus* (Fig. 28); gonopod plate without pointed projection (Fig. 29).

Material examined. 1F: GG- Gapyeong, Mogdong, 5.X.1985; 2F: GN- Sancheong-gun,



Figs 18-29. Adult genitalia. 18, *Mystacides azurea*, female, dorsal view; 19, *M. azurea*, female, lateral view; 20, *M. azurea*, female, ventral view; 21, *M. dentata*, male, dorsal view; 22, *M. dentata*, male, ventral view; 23, *M. dentata*, variant 1, male, abdominal segment IX, dorsal view; 24, *M. dentata*, male, phallus, lateral view; 25, *M. dentata*, male, lateral view; 26, *M. dentata*, variant 2, male, ventral view; 27, *M. dentata*, variant 2, male, dorsal view; 28, *Triaenodes unanimitis*, female, lateral view; 29, *T. unanimitis*, female, ventral view.

Sancheong-eub, Gyeonghogyo, 14.V.1998 (Y.J. Bae, J.M. Hwang, J.H. Hur, Y.H. Jin).

Distribution. East Palearctic (New record: South Korea) and West Palearctic.

ACKNOWLEDGEMENTS

We thank Dr. J. Morse (Clemson Univ., USA) who provided many literatures and useful comments. This work was supported by the Research Visit Grant in 1999 from the Korea Science and Engineering Foundation and the National Natural Science Foundation of China.

REFERENCES

- Botosaneanu, L. 1970. Trichoptères de la République Démocratique-Populaire de la Corée. *Annales Zoologici* 27: 275-359.
- Fischer, F.C.J. 1973. Trichopterorum catalogus. Nederlandse Entomologische Vereniging, Amsterdam.
- Kim, J.W. 1974. On the larvae of Trichoptera from Korea. *Korean J. Limnol.* 7: 1-42. (in Korean)
- Kobayashi, M. 1989. A taxonomic study on the Trichoptera of South Korea, with description of four new species (Insecta). *Bull. Kanagawa Pref. Mus.* 18: 1-9.
- Kononenko, V.S. 1997. Key to the insects of Russian Far East. Vol. V. In Trichoptera and Lepidoptera. Pt 1, 540 pp, Dal'nauka, Vladivostok.
- Kumanski, K. 1991. Studies on the fauna of Trichoptera (Insecta) of Korea II. Family Leptoceridae. *Hist. nat. Bulg.* 3: 49-71.
- Mey, W. 1989. Taxonomische und faunistische Notizen zu einigen köcherfliegen (Trichoptera) aus Korea. *Acta Entomol. Bohemoslov.* 86: 295-305.
- Morse, J.C. 1975. A phylogeny and revision of the caddisfly genus *Ceraclea* (Trichoptera, Leptoceridae). *Contrib. Am. Entomol. Inst.* 11: 1-97.
- Morse, J.C. 1981. A phylogeny and classification of family-group taxa of Leptoceridae (Trichoptera). *Proc. 3rd Int. Symp. Trichoptera* 20: 257-259.
- Park, S.J. and Y.J. Bae. 1998. Checklist of the Limnephiloidea (Trichoptera) of Korea. *Entomol. Res. Bull. (KEI)* 24: 33-42.
- Tsuda, M. 1942. Zur kenntnis der Koreanischen Trichopteren. *Mem. Coll. Sci., Kyoto Imperial Univ., Ser. B* 17: 227-237.
- Yang, L. and J.C. Morse. 1988. *Ceraclea* of the People's Republic of China (Trichoptera: Leptoceridae). *Contrib. Am. Entomol. Inst.* 23: 1-69.
- Yoon, I.B. and K.H. Kim. 1988. VI. Order Trichoptera. p. 430-551. In Illustrated Encyclopedia of Fauna and Flora of Korea, Vol. 30, Aquatic insects. Ministry of Education, Seoul. (in Korean)

한국산 나비날도래과 (날도래목)의 미기록종

박 선 진 · 배 연 재 · 楊 蓮 芳¹⁾

서울여자대학교 생물학과

¹⁾南京農業大學校 植物保護系

나비날도래과의 7종을 다음과 같이 한국에서 처음으로 기록하였다. *Mystacides azurea* (Linnaeus)를 한반도에서 처음으로 기록하였고, *Ceraclea armata* Kumanski, *C. lobulata* (Martynov), *C. morsei* Kumanski, *C. sibirica* (Ulmer), *Mystacides dentata* Martynov 및 *Triaenodes unanims* McLachlan을 남한에서 처음으로 기록하였다. 각종의 성충에 대한 진단문을 검색형질의 삽화와 함께 수록하였다. 또한 분류학적 소견, 이명 및 국명을 제시하였다.

(Received: September 2, 1999)

(Accepted: October 14, 1999)